



Blendworth Peaking Power Generation Plant

BS4142:2014 Assessment for Planning Application

28th September 2016

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EXECUTIVE SUMMARY

inacoustic has been commissioned by to carry out a noise assessment for a proposed Peaking Power Generation Plant on Land at Blendworth. The noise assessment is to accompany a full planning applications that have been submitted to the Havant Borough Council and East Hampshire District Council.

The suitability of the Site has been assessed based on the current development proposals and the predicted sound levels. Specific consideration has been given to the potential external noise impact on the nearest noise-sensitive receptors, in accordance with the National Planning Practice Guidance to the National Planning Framework, and BS4142:2014.

Target noise criteria have been set for all plant associated with the Proposed Development. Providing that the cumulative rating sound level from the mechanical plant items does not exceed the stated noise criteria, whether through the application of noise control techniques or otherwise, the impact of sound from such sources is predicted to have an impact not exceeding a *No Observed Adverse Effect Level* (NOAEL).

1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned to prepare a Noise Assessment for a Peaking Power Generation Plant ('the Proposed Development') on Land at Blendworth ('the Site').

The Applicant has submitted full planning applications ('the Applications') to the Havant Borough Council (HBC) and East Hampshire District Council (EHDC).

Accordingly, the following technical noise assessment has been produced to accompany the Application to HBC and EHDC. This report details the existing background sound climate at the nearest receptors, as well as the sound emissions associated with the Proposed Development.

This noise assessment is necessarily technical in nature; therefore a glossary of terms is included in Appendix A to assist the reader.

1.2. Scope and Objectives

The scope of the noise assessment can be summarised as follows:

- A baseline sound monitoring survey undertaken in the vicinity of the closest noise-sensitive receptors to the Site;
- Detailed sound modelling using the Brüel & Kjær Predictor modelling suite and ISO9613¹ prediction methodology to predict sound levels at the closest noise-sensitive receptors to the Site;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the proposed sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England: Noise² and BS4142:2014³.

¹ International Standards Organisation. ISO 9613-2:1996: Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere.

² Department for Communities and Local Government (DCLG), 2014. National Planning Practice Guidance for England: Minerals and Noise. DCLG.

³ British Standards Institution. BS4142:2014: Method for Rating and Assessing Industrial and Commercial Sound.

2. LEGISLATION AND POLICY FRAMEWORK

The development proposals for the Site are guided by the following policy directives and guidance:

2.1. National Policy

2.1.1. National Planning Policy Framework, 2012

The *National Planning Policy Framework* (NPPF)⁴ sets out the Government's planning policies for England. Planning policy requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise.

The NPPF is also a material consideration in planning decisions. It sets out the Government's requirements for the planning system and how these are expected to be addressed.

Under Section 11; Conserving and enhancing the natural environment, the following is stated:

"The planning system should contribute to and enhance the natural and local environment by:

- preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability".*

The document goes on to state:

"Planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

As stated above, this document makes reference to avoiding noise generation from new developments that would adversely impact on health and quality of life. The NPPF supersedes the previous noise guidance provided in *Planning Policy Guidance 24* (PPG24)⁵, but does not set absolute criteria.

⁴ Department for Communities and Local Government (DCLG), 2012. *National Planning Policy Framework*. HMSO. London.

⁵ Department of The Environment, now Department of Community and Local Government: 1994: *Planning and Noise Planning Policy Guidance 24*, HMSO, London.

2.1.2. Noise Policy Statement for England, 2010

The underlying principles and aims of existing noise policy documents, legislation and guidance are clarified in *DEFRA: 2010: Noise Policy Statement for England (NPSE)*⁶. The NPSE sets out the “Long Term Vision” of Government noise policy as follows:

“Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development”.

The NPSE outlines three aims for the effective management and control of environmental, neighbour and neighbourhood noise:

- *“Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life”.*

The guidance states that it is not possible to have a single objective noise-based measure that defines “*Significant Observed Adverse Effect Level (SOAEL)*” that is applicable to all sources of noise in all situations and that not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

2.1.3. National Planning Practice Guidance in England: Noise, 2014

Further guidance in relation to the NPPF and the NPSE has been published in the *National Planning Practice Guidance in England: Noise (NPPG Noise)*⁷, which summarises the noise exposure hierarchy, based on the likely average response. The following three observed effect levels are identified below:

- **Significant Observed Adverse Effect Level:** This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- **Lowest Observed Adverse Effect Level:** This is the level of noise exposure above which adverse effects on health and quality of life can be detected; and
- **No Observed Adverse Effect Level:** This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

⁶ Department for Environment, Food and Rural Affairs (DEFRA), 2010. Noise Policy Statement for England. DEFRA.

⁷ Department for Communities and Local Government (DCLG), 2014. National Planning Practice Guidance for England: Noise. DCLG.

Criteria related to each of these levels are reproduced in Table 1.

TABLE 1: SIGNIFICANCE CRITERIA FROM NPPG IN ENGLAND: NOISE

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not Noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and Not Intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and Very Disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.2. British Standards

2.2.1. BS4142:2014

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014 states: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs"*. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- *"Typically, the greater this difference, the greater the magnitude of the impact."*
- *"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."*
- *"A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."*
- *"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a **Significant Observed Adverse Effect Level**;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a **Lowest Observed Adverse Effect Level**;
- The lower the rating sound level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating sound level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, and would therefore be classified as a **No Observed Adverse Effect Level**.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

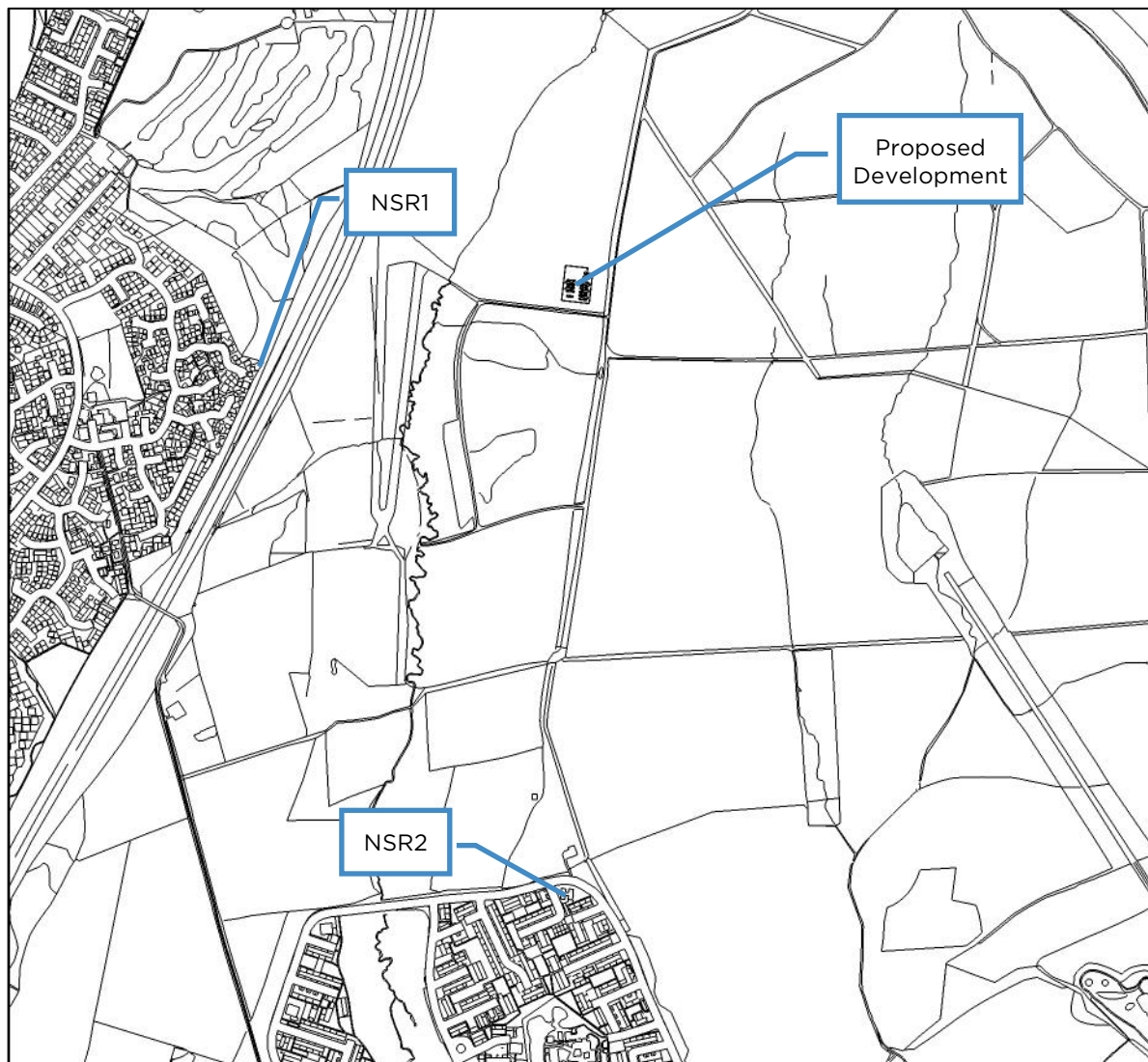
3. SITE DESCRIPTION

3.1. Site and Surrounding Area

The Proposed Development is on Land at Blendworth. The A3(M) is located to the west of the site.

The location of the Proposed Development and the nearest receptors can be seen below in Figure 1.

FIGURE 1: PLAN OF SITE AND SURROUNDING AREA



4. MEASUREMENT METHODOLOGY

4.1. General

The dwellings at which background sound measurements have been made at were chosen as being representative of the nearest properties to the Proposed Development.

The background sound measurements were carried out in accordance with BS4142:2014.

Long-term background sound measurements were conducted over five days at two locations representative of the nearest noise sensitive properties to the Site, inclusive of a weekend period. Background sound measurements were undertaken from Wednesday 24th August 2016 to Monday 29th August 2016.

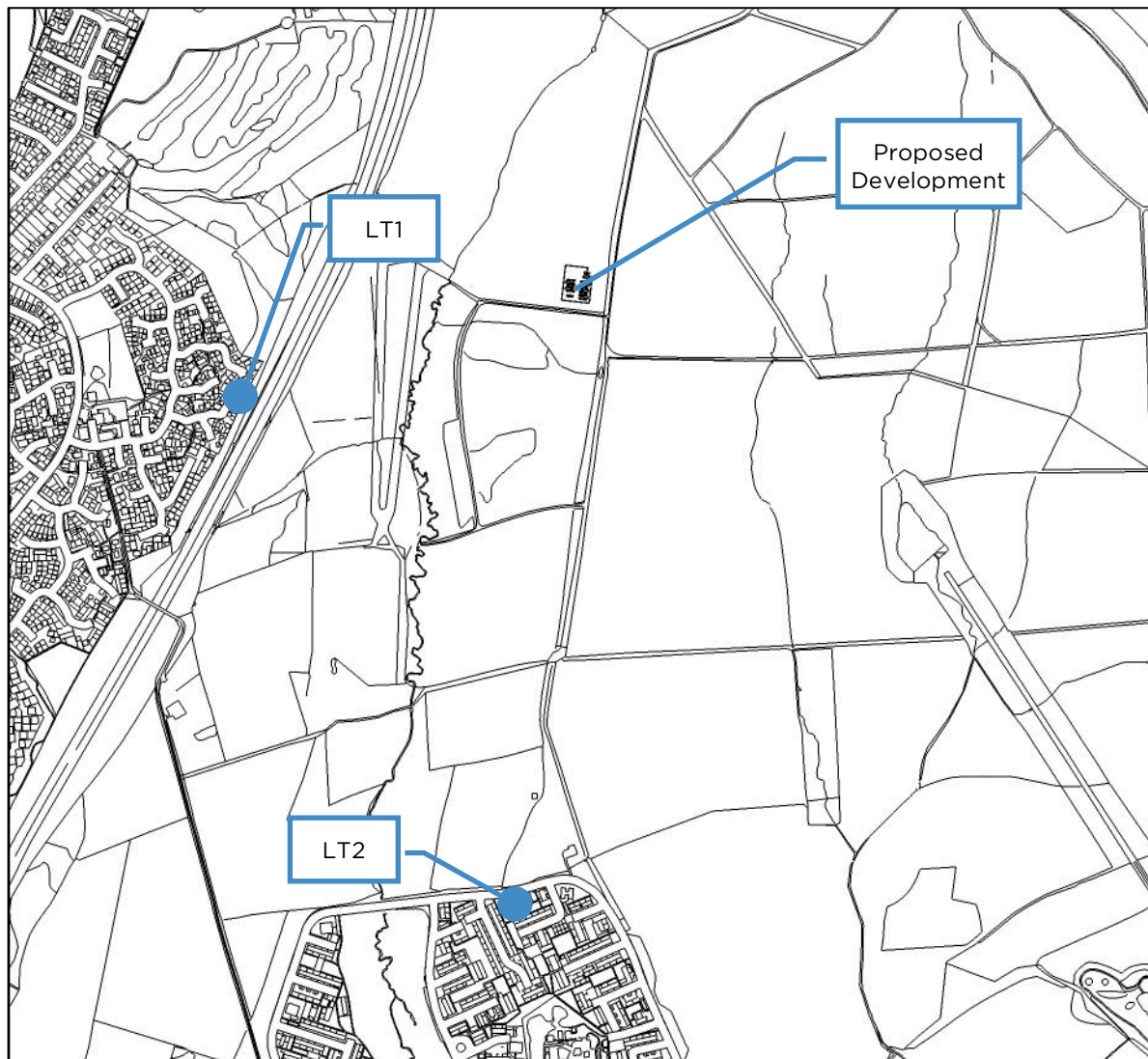
The measurement locations are discussed below in Table 2, with an aerial photograph indicating their respective locations shown overleaf in Figure 2.

TABLE 2: MEASUREMENT POSITION DESCRIPTIONS

Measurement Position	Description
LT1	Background sound measurements were undertaken on land associated with a property on Cornbrook Grove. Whilst on Site, the following sound sources were noticed; road traffic from the A3(M); and wind induced vegetation sound.
LT2	Background sound measurements were undertaken on land associated with a property on Swanmore Road. Whilst on Site, the following sound sources were noticed; road traffic from the A3(M); and wind induced vegetation sound.

Photographs of LT1, and LT2 can be seen in Appendix E of this report.

FIGURE 2: MEASUREMENT POSITIONS



4.2. Weather Conditions

The long-term background sound survey was conducted with predominantly southwesterly and westerly winds, at wind speeds of less than 5 ms^{-1} . There were no periods of prolonged precipitation throughout the background sound survey.

4.3. Sound Indices and Procedure

4.3.1. Background

The background sound measurements were taken at a microphone height of approximately 1.4 metres above local ground level, away from reflecting surfaces other than the ground, with a wind shield used throughout. The measurements were sampled over a 15 minute duration.

The parameters reported are the statistical indices $L_{A10,T}$ and the Background Sound Level, $L_{A90,T}$, as well as the Equivalent Continuous Sound Level, $L_{Aeq,T}$ and the Maximum Sound Pressure Level, L_{AFmax} . An explanation of the sound units presented is given in Appendix A.

The measured L_{Aeq} , L_{AFmax} , and L_{AF90} sound levels are presented as time histories in a graph in Appendix B. Furthermore, the statistical distribution of the measured background sound levels during the day and night time periods are presented in a graphical format in Appendix C. A fully tabulated set of the measurement results can be seen in Appendix D.

4.4. Equipment

The sound measurement exercise was undertaken by a consultant certified as competent in environmental sound monitoring, and, in accordance with the principles of BS 7445⁸ and following the guidance given in BS4142:2014.

The acoustic measurement equipment used during the sound survey conformed to Type 1 specification of British Standard 61672⁹. A full inventory of this equipment is shown in Table 3 below:

TABLE 3: INVENTORY OF SOUND MEASUREMENT EQUIPMENT

Measurement Position	Make, Model & Description	Serial Number	Calibration Certificate Number	Calibration Due Date
LT1	Rion NL-52 Sound Level Meter	00943282	CONF011519	27/01/2017
	Rion NH-25 Preamplifier	43298	CONF011519	27/01/2017
	Rion UC-59 Microphone	07045	CONF011519	27/01/2017
LT2	Rion NL-52 Sound Level Meter	00943360	CONF011522	28/01/2017
	Rion NH-25 Preamplifier	43376	CONF011522	28/01/2017
	Rion UC-59 Microphone	07154	CONF011522	28/01/2017
All	Cirrus CR:515 Acoustic Calibrator	72886	2015-1008	07/10/2016

The sound measurement equipment used during the survey was field calibrated at the start and end of the measurement period. A UKAS accredited calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements. A drift of less than 0.2 dB in the field calibration was found to have occurred on all sound level meters. The microphones were fitted with a protective windshields for the entire measurement period.

⁸ British Standard 7445: 2003: *Description and measurement of environmental noise*. BSI

⁹ British Standard 61672: 2003: *Electroacoustics. Sound level meters. Part 1 Specifications*. BSI.

4.5. Sound Survey Results

4.5.1. Background

The typical measured background sound level, during the day and night time periods, can be seen below in Table 4.

TABLE 4: BACKGROUND SOUND MEASUREMENT RESULTS

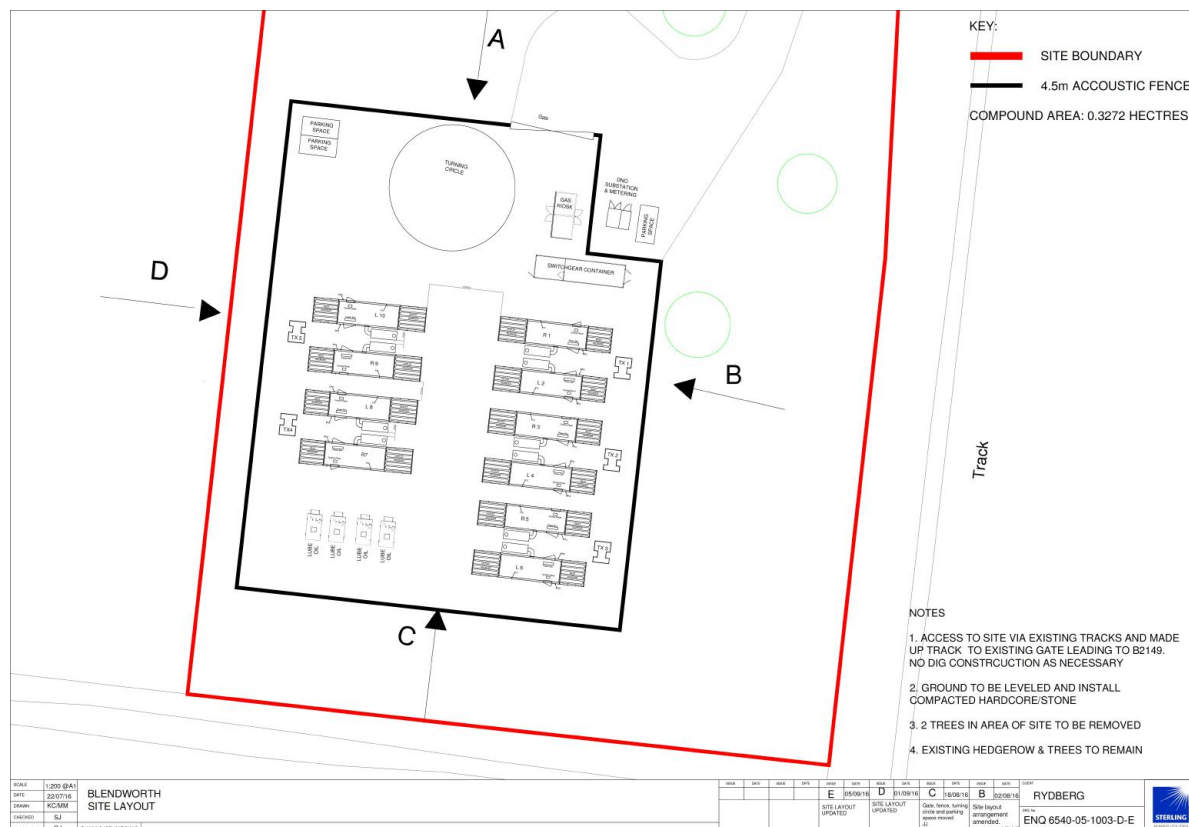
Measurement Position	Period	Measurement Interval, T (minutes)	Typical Background Sound Level, $L_{AF90,T}$ (dB)
LT1	Day	60	56
	Night	15	36
LT2	Day	60	39
	Night	15	29

5. CALCULATIONS

5.1. Proposed Operations Overview

The site layout for the Proposed Development can be seen below in Figure 3. It is proposed that an acoustic fence, with a minimum surface density of 10 kgm^{-2} and height of 4.5 m is also constructed as part of the proposal, to minimise noise breakout.

FIGURE 3: PROPOSED SITE LAYOUT



Peaking Power Generation Plant are designed to cover potential energy shortages, supplying electricity to the National Grid when necessary. As such, they have a short-term operational nature, and they are more likely to operate during peak load hours only, when the demand for electricity is higher, but they have potential to operate at any time.

The development proposals comprise a maximum of ten MTU 2 MWe engine-driven electricity generating sets per unit that together will generate a total of c.20 MWe. Each of the ten engines will be housed within a purpose built container, as supplied by the manufacturer.

In addition to the generator set, other sources of sound include; the exhaust flue; a ventilation inlet and outlet; an air cooler (hereon in collectively referred to has a 'genset'); and transformers, all of which are distributed throughout the Proposed Development.

Finally, it is possible that other, similar engine-driven electricity generating sets may be used (eg MWM), however, the enclosures will be appropriately designed by the manufacturers to ensure the specifications, as outlined overleaf, are achieved.

5.2. Methodology

5.2.1. Source Data

The A-weighted sound power levels, associated with the Proposed Development, based on manufacturer and vendor data, can be seen below in Table 5.

TABLE 5: SOUND POWER LEVEL SOURCE DATA

Plant	Quantity	Sound Power Level, L_{WA} (dB)	A-weighted Octave Band Sound Power Level, Hz (dB)							
			63	125	250	500	1k	2k	4k	8k
Genset	10	123	85	103	110	113	114	114	111	119
Exhaust	10	117	87	106	106	109	111	111	108	100
Transformer ¹⁰	5	78	55	67	69	75	72	68	63	54
Intake	10	73	35	55	62	57	44	43	63	72
Outlet	10	73	37	56	63	56	48	47	63	72
Air Cooler	10	73	44	62	63	67	69	65	58	51

The gensets will each be housed within a separate container. The vendor has advised that these enclosures will be designed for a maximum noise breakout of 65 dB(A) at 1 m. Exhaust silencers will be designed to provide adequate attenuation for the maximum exhaust stack Sound Pressure Level to be limited to 65 dB(A) at 1 m.

It should be noted that the sound pressure level for the transformer has been supplied by the vendor. The octave band sound power level has been derived using *Toward a Realistic Estimate of Octave Band Sound Levels for Electric Transformers* by Robert D. Stevens and Chris Hung¹⁰.

5.2.2. Calculation Process

Calculations were carried out using Brüel & Kjær Predictor v6.2, which undertakes its calculations in accordance with guidance given in ISO9613-1:1993 and ISO9613-2:1996.

5.2.3. Assumptions

Given that the land between proposed development and nearest receptors is mixed, the ground factor has been set according to ground type, using 'ground areas' in the calculation software. The ground area associated with the Proposed Development has been set to 'hard'.

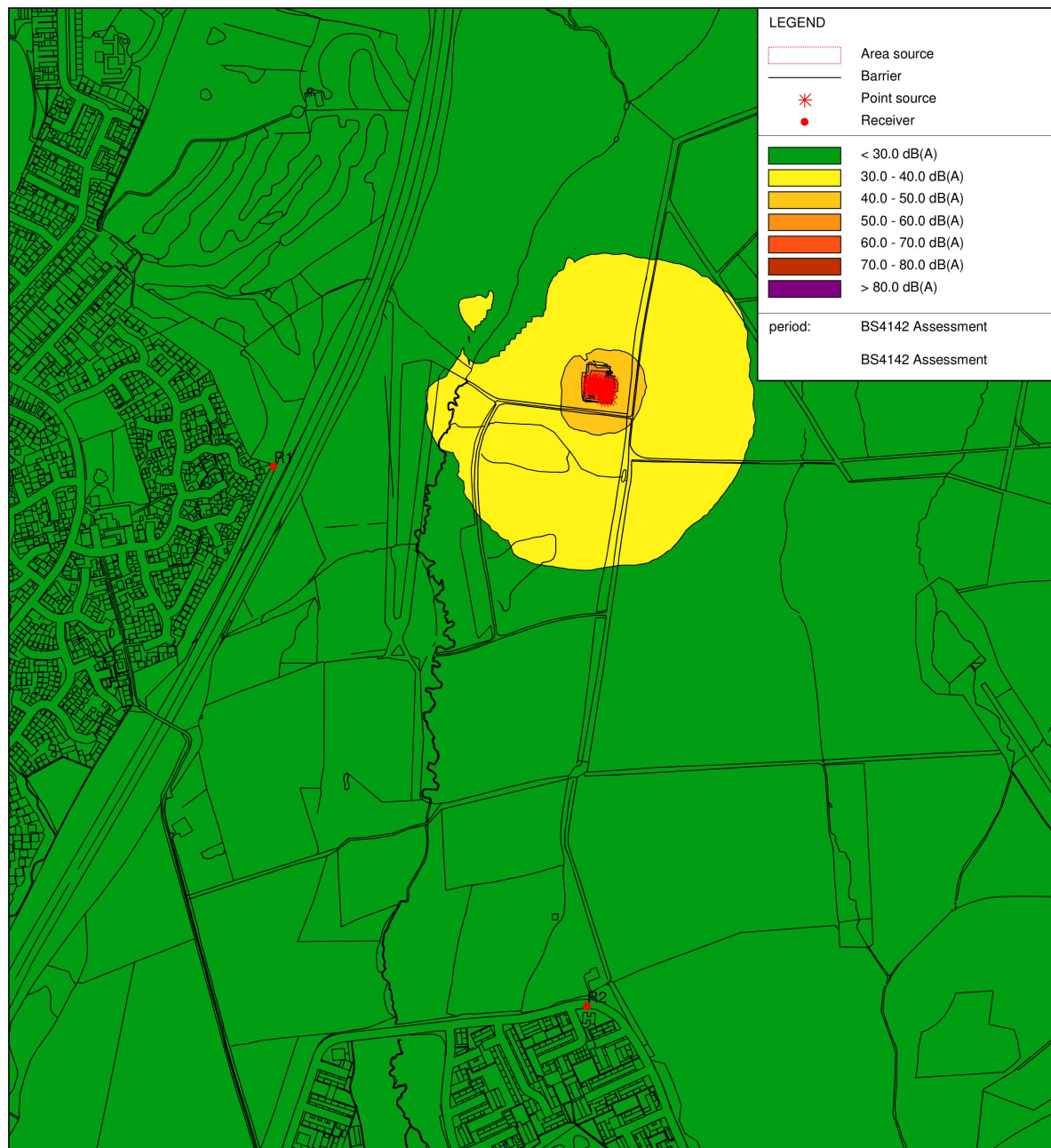
It has been assumed that all processes will occur simultaneously, representing a worst-case scenario. In order to accurately model the land surrounding the development, an AutoCAD DXF drawing was produced, which was based on data provided by the Ordnance Survey.

¹⁰ Toward a Realistic Estimate of Octave Band Sound Levels for Electric Transformers. Robert D. Stevens and Chris Hung. Canadian Acoustics 13 Vol. 38 No. 1 (2010). <http://jcaa.caa-aca.ca/index.php/jcaa/article/view/2214> (last accessed 28/08/2016).

5.2.4. Specific Sound Level Map

The sound map showing the specific sound level emissions from the Proposed Development can be seen below in Figure 4.

FIGURE 4: SPECIFIC SOUND LEVEL MAP



5.2.5. Specific Sound Level Summary

A summary of the predicted specific sound levels at the NSRs, based on the sound map shown in Figure 4, can be seen below in Table 6.

TABLE 6: PREDICTED SPECIFIC SOUND LEVEL SUMMARY

NSR	Specific Sound Level (dB)	
	Gensets	Transformers
1	24	10
2	16	4

6. BS4142:2014 ASSESSMENT

6.1. Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

“Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method.”*

Given that the Proposed Development is not operational, the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

“Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.

Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources.”

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

Tonality

A rating penalty of +2 dB is applicable for a tone which is *“just perceptible”*, +4 dB where a tone is *“clearly perceptible”*, and +6 dB where a tone is *“highly perceptible”*.

Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is *“just perceptible”*, +6 dB where it is *“clearly perceptible”*, and +9 dB where it is *“highly perceptible”*.

Other Sound Characteristics

BS4142:2014 states that where *“the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied.”*

Intermittency

BS4142:2014 states that when the “specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.”

6.1.1. Rating Penalty Assessment

Considering the content of Section 6.1, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, and has been detailed in Table 7 below.

TABLE 7: RATING PENALTY ASSESSMENT

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
Gensets	+2 dB	0 dB	+3 dB	0 dB	The gensets will operate intermittently, as demand requires, hence a correction for intermittency. Tonality may be “just perceptible” if the specific sound level is high enough, but the residual acoustic environment is likely mask any significant tones. Furthermore, the spectral data used in the assessment did not intake any unusually tonal octave bands.
Transformers	+4 dB	0 dB	+3 dB	0 dB	The transformers will operate intermittently, as demand requires, hence correction for intermittency. Tonality may be “clearly perceptible” if the specific sound level is high enough, but the residual acoustic environment is likely mask any significant tones. Transformers do sometimes exhibit an electrical phase related ‘hum’.

6.2. Uncertainty

BS4142:2014 requires that the level of uncertainty in the measured data and associated calculations is considered in the assessment. The Standard recommends that steps should be taken to reduce the level of uncertainty.

6.2.1. Measurement Uncertainty

BS4142:2014 states that measurement uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

- “ ...
- b) *the complexity and level of variability of the residual acoustic environment;*
 - ...
 - d) *the location(s) selected for taking the measurements;*
 - ...
 - g) *the measurement time intervals;*
 - h) *the range of times when the measurements have been taken;*
 - i) *the range of suitable weather conditions during which measurements have been taken;*
 - ...
 - k) *the level of rounding of each measurement recorded; and*
 - l) *the instrumentation used.”*

Each of the measurement uncertainty factors outlined above have been considered and discussed in Table 8 below.

TABLE 8: MEASUREMENT UNCERTAINTY FACTORS

Measurement Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Residual acoustic environment is simple, with road traffic associated with the A3(M) being the most significant contributor.
d)	0 dB	Measurements were undertaken on land associated with the nearest noise-sensitive receptors, hence no further correction needs to be made.
g)	0 dB	Measurement time intervals were set in accordance with BS4142:2014, hence no further correction needs to be made.
h)	0 dB	Measurements were undertaken over two separate survey periods and the background sound levels presented in this report are broadly similar (within a few decibels), indicating a good level of repeatability.
i)	0 dB	An anemometer and rain gauge were deployed for the duration of the background sound survey. The periods of data used to derive the typical background sound levels had relatively neutral weather conditions; therefore the impact on the measured values would have been minimal.
k)	0 dB	Measured values were rounded to 0.1 dB, therefore rounding would not have had a significant impact on the overall typical background sound levels.
l)	0 dB	The acoustic measurement equipment accorded with Type 1 specification of British Standard 61672, and were deployed with appropriate wind shields.

In summary, no further correction has been included in the assessment, to account for measurement uncertainty.

6.2.2. Calculation Uncertainty

BS4142:2014 states that calculation uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

“ ...

- b) uncertainty in the operation or sound emission characteristics of the specific sound source and any assumed sound power levels;*
- c) uncertainty in the calculation method;*
- d) simplifying the real situation to “fit” the model (user influence on modelling); and*
- e) error in the calculation process.”*

Each of the calculation uncertainty factors outlined above have been considered and discussed in Table 9 below.

TABLE 9: CALCULATION UNCERTAINTY FACTORS

Measurement Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	+3 dB	Sound pressure levels have been supplied by the Vendor, hence a correction for uncertainty.
c)	0 dB	Calculations were undertaken in accordance with ISO 9613-2, which is considered a “ <i>validated method</i> ” by BS4142:2014.
d)	0 dB	The real situation has not been simplified for the purposes of this assessment.
e)	+1 dB	ISO 9613-2 indicates that there is a ± 3 dB accuracy to the prediction method, therefore, an uncertainty factor of +1 dB is considered appropriate and proportional.

In summary, a correction of +4 dB has been included in the assessment, to account for calculation uncertainty.

6.3. Rating Sound Level

Incorporating the rating penalties detailed in Section 6.1 with the predicted specific sound levels, as detailed in Table 6, the rating sound levels have been derived and have been detailed in Table 10 below.

TABLE 10: RATING SOUND LEVELS

NSR	Rating Sound Level (dB)		
	Gensets	Transformers	Overall
1	29	17	29
2	21	11	22

6.4. Assessment

The rating sound level, as calculated from the predicted specific sound level, has been assessed in accordance with BS4142:2014, at all NSRs.

The BS4142:2014 assessment at NSR1, during the day and night time periods, can be seen below in Table 11.

TABLE 11: BS4142:2014 ASSESSMENT AT NSR1

Results	Sound Level (dB)	Notes
Rating Sound Level	29	As shown in Table 10.
Measurement Uncertainty	0	As discussed in Table 8.
Calculation Uncertainty	+4	As discussed in Table 9.
Daytime Background Sound Level	56	As shown in Table 4.
Excess of Rating over Daytime Background Sound Level	-23	Assessment indicates a “ Low Impact ”.
Night Time Background Sound Level	36	As shown in Table 4.
Excess of Rating over Night Time Background Sound Level	-3	Assessment indicates a “ Low Impact ”.

The BS4142:2014 assessment at NSR2, during the day and night time periods, can be seen below in Table 12.

TABLE 12: BS4142:2014 ASSESSMENT AT NSR2

Results	Sound Level (dB)	Notes
Rating Sound Level	22	As shown in Table 10.
Measurement Uncertainty	0	As discussed in Table 8.
Calculation Uncertainty	+4	As discussed in Table 9.
Daytime Background Sound Level	39	As shown in Table 4.
Excess of Rating over Daytime Background Sound Level	-13	Assessment indicates a “ Low Impact ”.
Night Time Background Sound Level	29	As shown in Table 4.
Excess of Rating over Night Time Background Sound Level	-3	Assessment indicates a “ Low Impact ”.

7. CONCLUSION

inacoustic has been commissioned to prepare a Noise Assessment for a Peaking Power Generation Plant on Land at Blendworth ('the Site').

Noise limits at nearest noise-sensitive receptors to the Site are suggested, based on the guidance contained within BS4142:2014 and having regard to the measured background sound levels at locations taken to be representative of the dwellings selected for this assessment.

Site noise measurements have been undertaken for two locations, taken to be representative of the nearest dwellings to the Proposed Development. The predicted rating sound levels are presented for inspection and comparison with the suggested site noise limits at the dwellings.

Target noise criteria have been set for all plant associated with the Proposed Development. Providing that the cumulative rating sound level from the mechanical plant items does not exceed the stated noise criteria, whether through the application of noise control techniques or otherwise, the impact of sound from such sources is predicted to have an impact not exceeding a *No Observed Adverse Effect Level* (NOAEL).

Since the Proposed Development conforms to National Planning Policy requirements; it is recommended that noise should not be a constraint to the approval of this Planning Application.

8. APPENDICES

8.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of $20\mu\text{Pa}$ (20×10^{-6} Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1 / s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

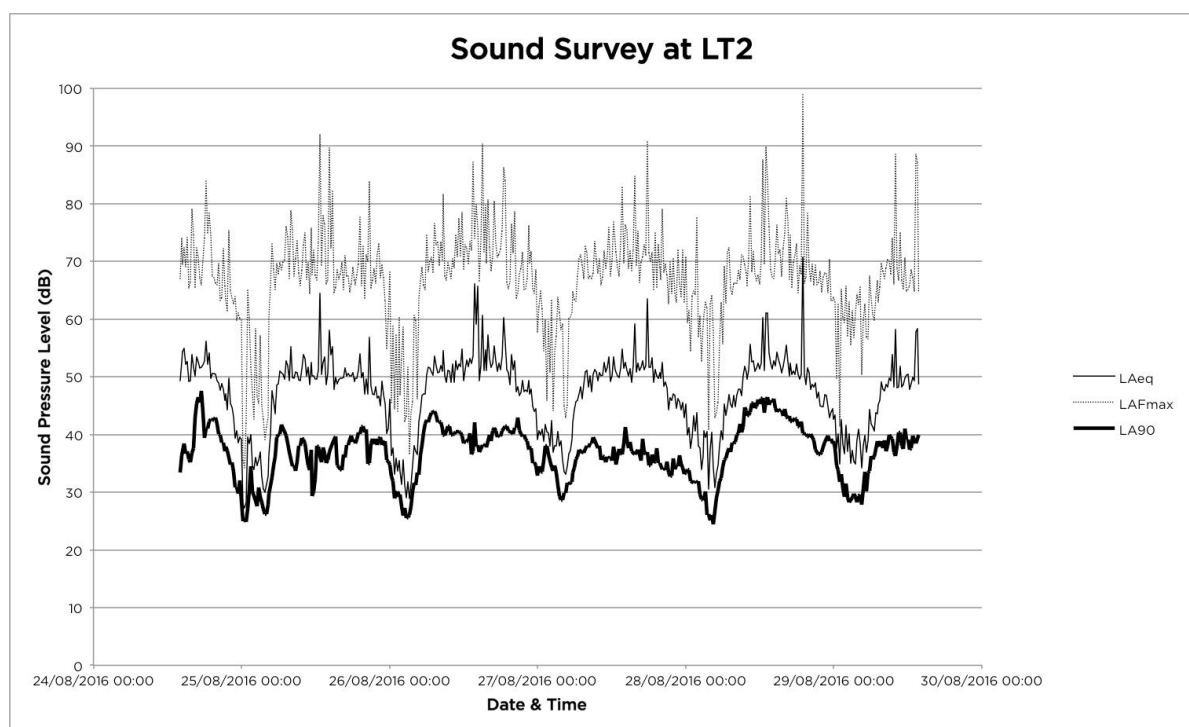
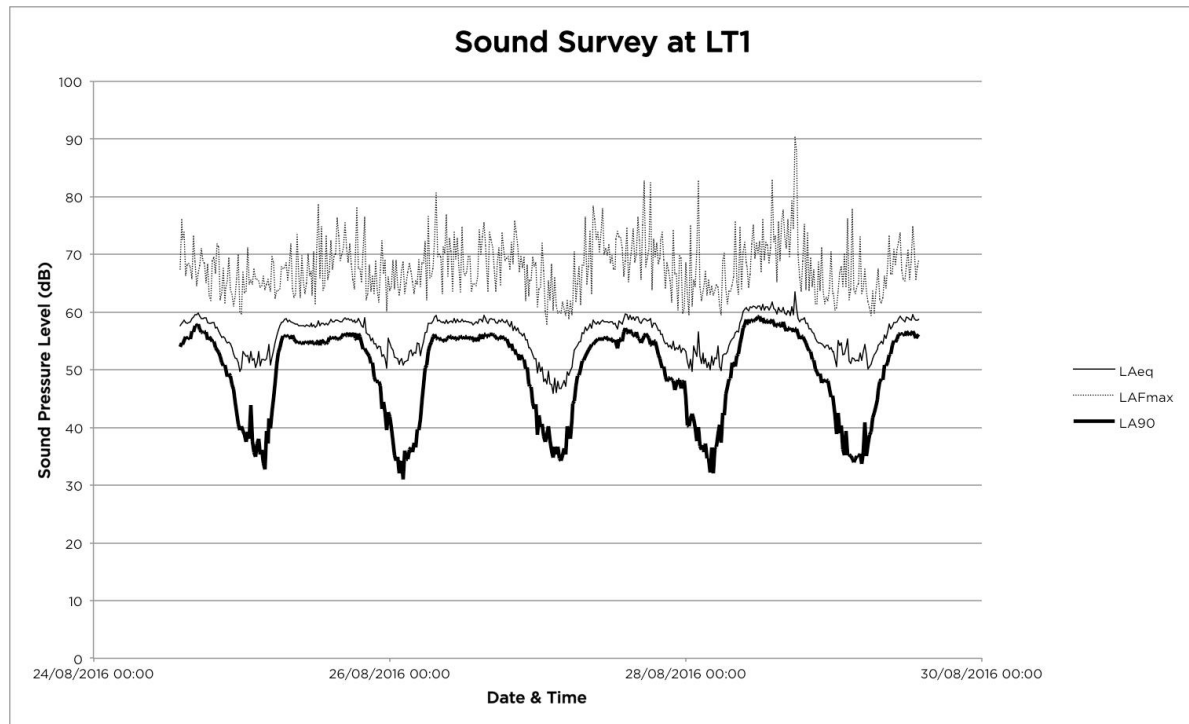
For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} .

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

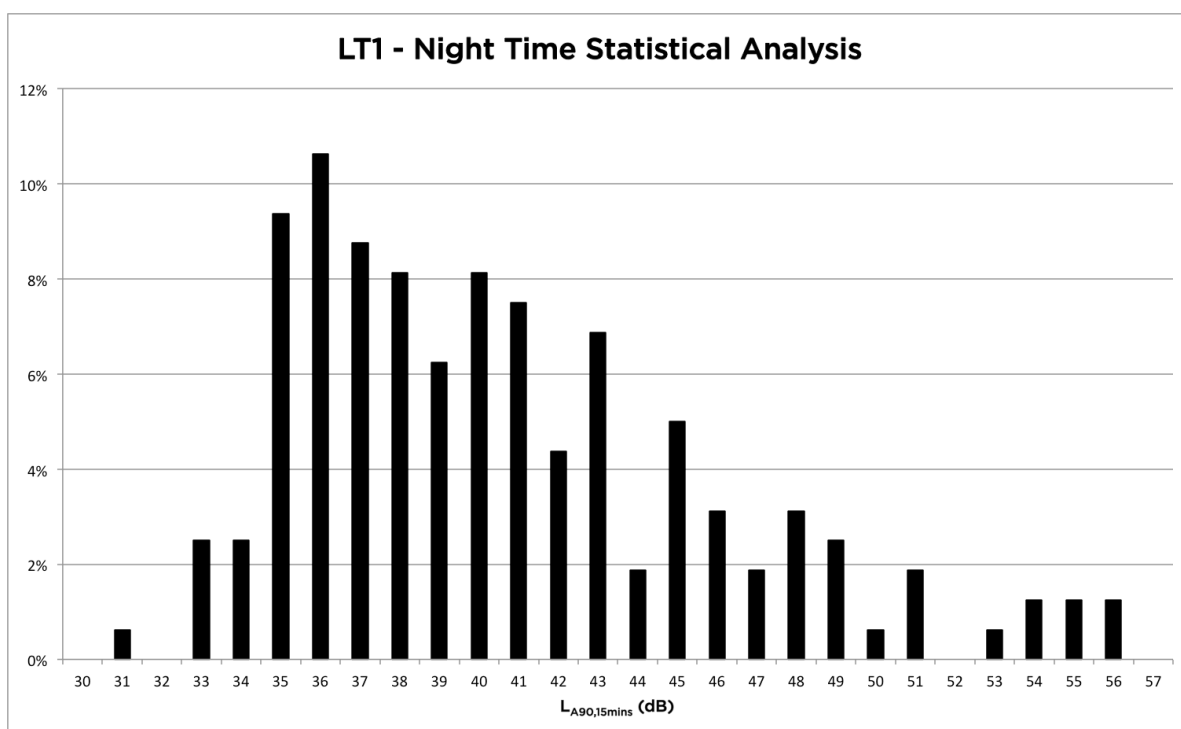
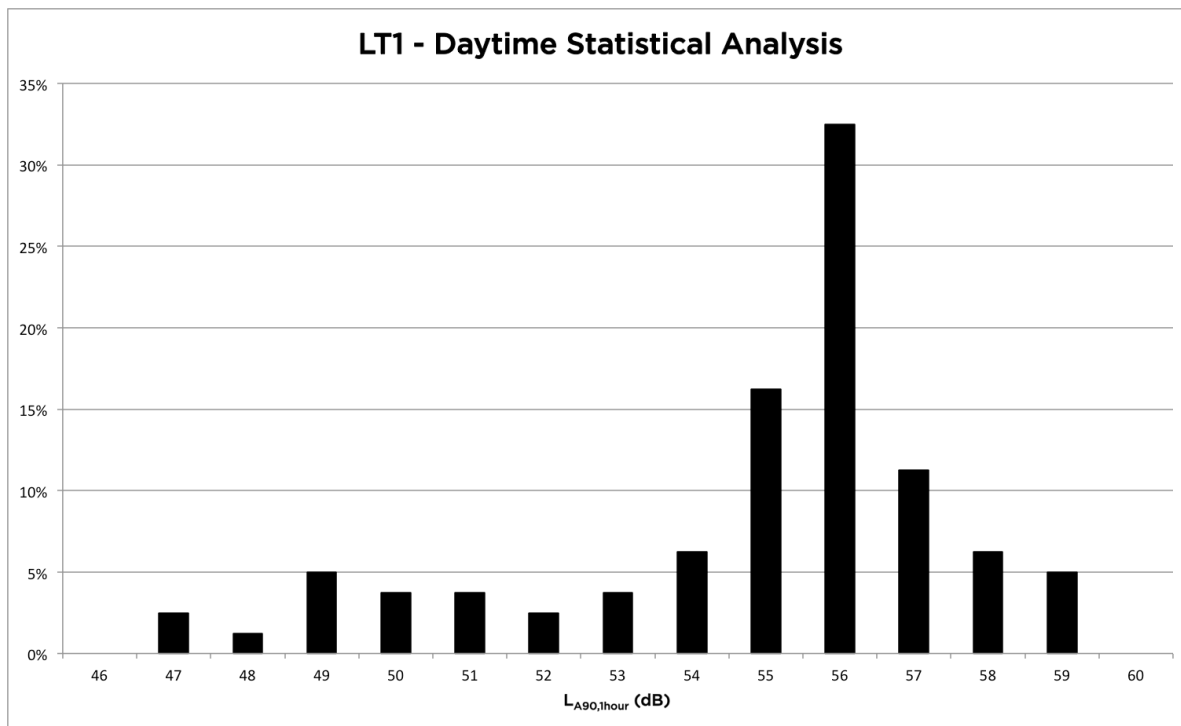
To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

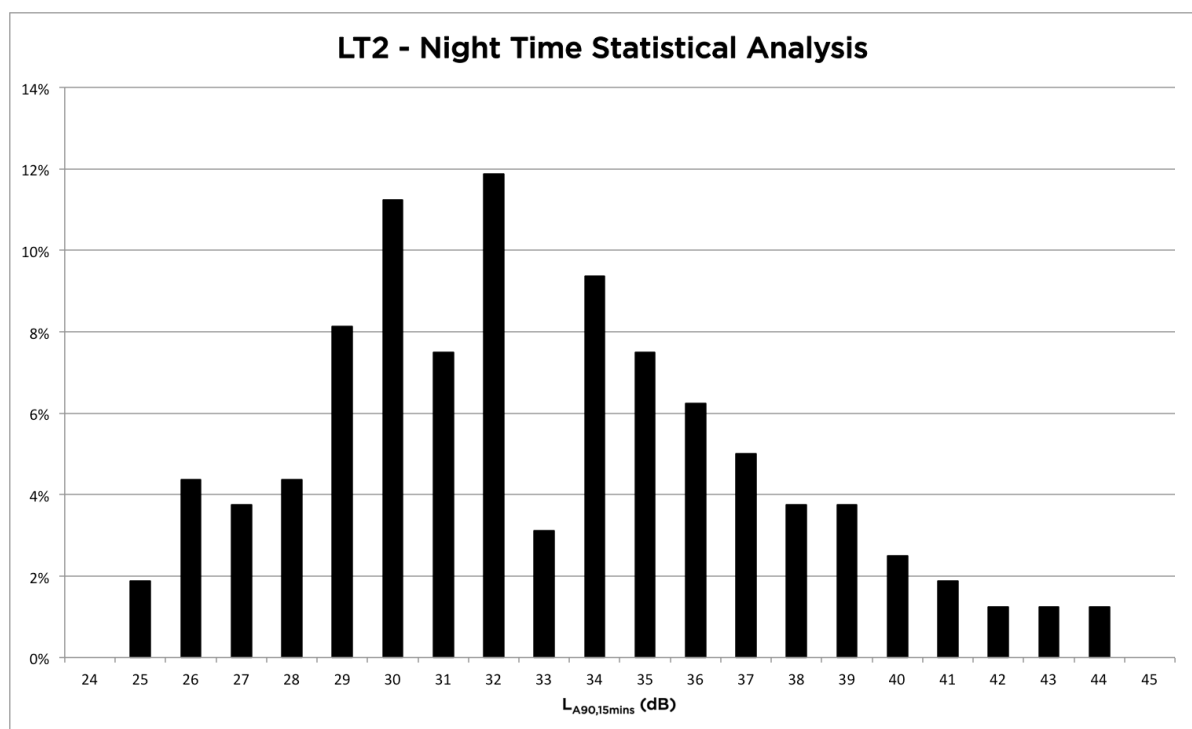
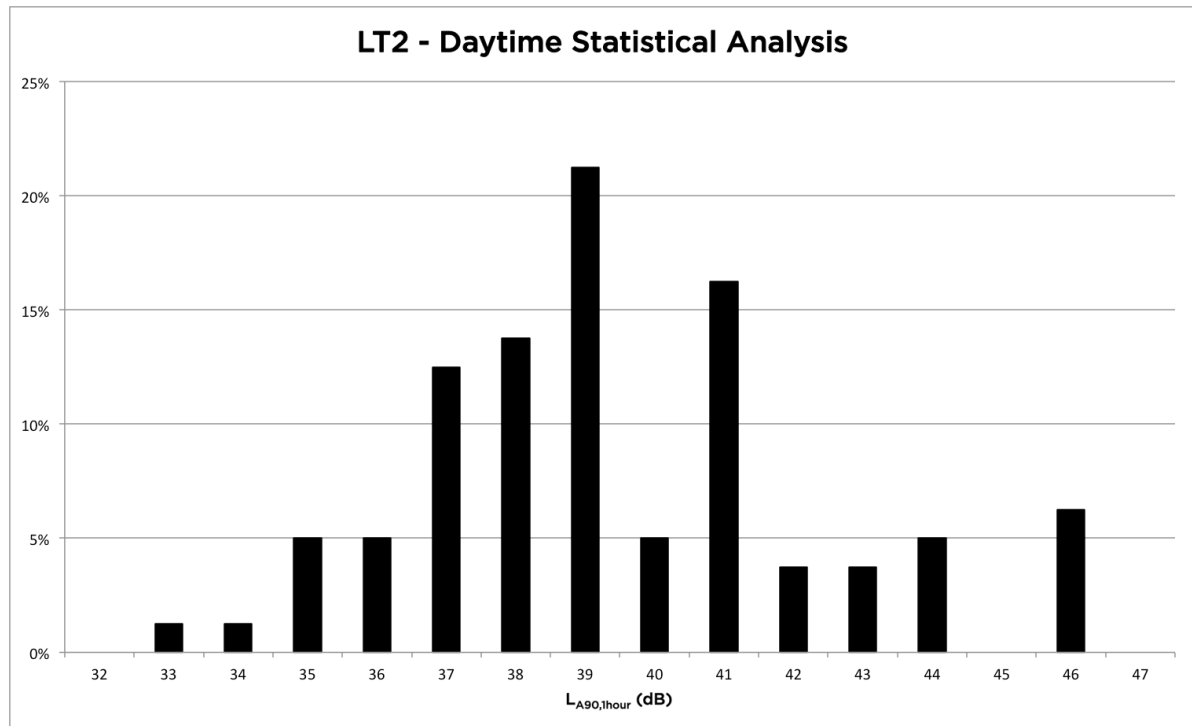
Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1\text{hour}}$ dB and $L_{A90,15\text{mins}}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

8.2. Appendix B – Sound Measurement Results



8.3. Appendix C – Statistical Analysis





8.4. Appendix D – Tabulated Measurement Results

TABLE 13: LT1 TABULATED MEASUREMENT RESULTS

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
24/08/2016 14:00	76.0	58.1	59.8	54.6	N
24/08/2016 15:00	68.4	58.2	59.9	55.5	N
24/08/2016 16:00	73.2	59.3	60.7	57.2	N
24/08/2016 17:00	71.0	59.3	60.7	57.0	N
24/08/2016 18:00	68.4	58.6	60.2	56.0	N
24/08/2016 19:00	69.5	57.9	59.7	54.8	N
24/08/2016 20:00	71.8	56.5	58.5	52.6	N
24/08/2016 21:00	67.6	55.3	57.9	50.1	N
24/08/2016 22:00	69.4	54.0	56.9	48.1	N
24/08/2016 23:00	62.7	52.1	55.3	44.4	N
24/08/2016 23:15	65.9	52.0	55.3	42.5	N
24/08/2016 23:30	69.9	51.3	54.4	40.7	N
24/08/2016 23:45	60.1	49.8	53.8	39.5	N
25/08/2016 00:00	59.7	50.3	54.3	40.2	N
25/08/2016 00:15	66.9	53.1	57.3	39.4	N
25/08/2016 00:30	63.4	52.8	57.5	38.7	N
25/08/2016 00:45	63.6	52.3	57.1	37.5	N
25/08/2016 01:00	71.2	52.5	56.1	39.3	N
25/08/2016 01:15	64.9	51.3	55.3	38.0	N
25/08/2016 01:30	65.6	53.2	57.4	43.9	N
25/08/2016 01:45	64.9	51.6	56.4	37.7	N
25/08/2016 02:00	67.5	51.9	56.8	35.8	N
25/08/2016 02:15	65.8	50.5	55.6	34.9	N
25/08/2016 02:30	65.7	51.2	55.6	37.2	N
25/08/2016 02:45	65.4	53.1	57.7	38.1	N
25/08/2016 03:00	64.3	50.7	56.0	35.3	N
25/08/2016 03:15	64.6	51.8	56.8	36.1	N
25/08/2016 03:30	66.3	51.8	56.5	33.8	N
25/08/2016 03:45	63.9	51.7	56.9	32.7	N
25/08/2016 04:00	64.9	52.0	56.4	39.4	N
25/08/2016 04:15	65.7	53.5	58.5	37.2	N
25/08/2016 04:30	64.8	54.4	58.8	41.6	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
25/08/2016 04:45	63.6	50.8	55.0	39.8	N
25/08/2016 05:00	69.6	52.2	55.2	42.8	N
25/08/2016 05:15	68.5	53.5	56.5	45.1	N
25/08/2016 05:30	62.4	54.8	58.0	47.9	N
25/08/2016 05:45	63.6	55.9	58.6	51.0	N
25/08/2016 06:00	63.8	56.9	59.0	53.0	N
25/08/2016 06:15	64.1	57.6	59.6	53.9	N
25/08/2016 06:30	67.9	58.2	59.9	55.1	N
25/08/2016 06:45	67.6	58.4	60.1	55.9	N
25/08/2016 07:00	68.5	58.7	60.3	55.9	N
25/08/2016 08:00	71.8	58.2	59.9	55.4	N
25/08/2016 09:00	73.4	57.7	59.6	54.7	N
25/08/2016 10:00	70.1	57.7	59.5	54.7	N
25/08/2016 11:00	70.5	57.7	59.6	54.8	N
25/08/2016 12:00	78.6	57.8	59.7	54.7	N
25/08/2016 13:00	74.8	58.0	59.8	54.8	N
25/08/2016 14:00	72.4	58.3	60.0	55.3	N
25/08/2016 15:00	76.3	58.5	60.1	55.5	N
25/08/2016 16:00	75.5	58.6	60.0	55.9	N
25/08/2016 17:00	71.8	58.8	60.3	56.2	N
25/08/2016 18:00	78.1	58.4	60.1	55.7	N
25/08/2016 19:00	70.7	58.1	59.9	55.1	N
25/08/2016 20:00	76.4	57.1	58.9	53.0	N
25/08/2016 21:00	68.8	54.9	57.5	49.8	N
25/08/2016 22:00	72.3	53.6	56.5	46.6	N
25/08/2016 23:00	66.8	52.6	55.6	44.5	N
25/08/2016 23:15	68.9	52.0	54.8	42.5	N
25/08/2016 23:30	60.2	50.3	54.3	39.6	N
25/08/2016 23:45	66.1	55.5	59.6	42.7	N
26/08/2016 00:00	63.8	54.7	58.9	41.8	N
26/08/2016 00:15	64.4	53.8	58.1	39.9	N
26/08/2016 00:30	68.9	53.4	57.9	37.7	N
26/08/2016 00:45	64.0	52.2	56.8	35.2	N
26/08/2016 01:00	69.0	52.1	55.6	34.2	N
26/08/2016 01:15	64.8	51.9	56.4	34.9	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
26/08/2016 01:30	63.0	51.0	56.4	32.1	N
26/08/2016 01:45	63.9	51.5	56.5	33.3	N
26/08/2016 02:00	67.3	52.0	57.0	34.3	N
26/08/2016 02:15	68.7	50.9	55.6	31.0	N
26/08/2016 02:30	63.2	51.4	56.3	36.0	N
26/08/2016 02:45	65.1	51.5	56.4	34.5	N
26/08/2016 03:00	67.1	51.7	56.4	34.5	N
26/08/2016 03:15	68.4	53.2	57.8	36.2	N
26/08/2016 03:30	67.0	53.5	58.1	36.6	N
26/08/2016 03:45	65.1	52.5	57.2	35.7	N
26/08/2016 04:00	63.2	53.0	57.8	37.3	N
26/08/2016 04:15	65.4	52.9	57.9	36.6	N
26/08/2016 04:30	64.9	54.6	59.0	39.7	N
26/08/2016 04:45	69.1	54.5	58.6	39.6	N
26/08/2016 05:00	64.5	52.5	56.2	41.5	N
26/08/2016 05:15	68.6	53.8	57.0	44.7	N
26/08/2016 05:30	68.5	54.9	57.8	47.5	N
26/08/2016 05:45	72.2	56.4	58.7	50.3	N
26/08/2016 06:00	62.2	56.5	59.1	50.8	N
26/08/2016 06:15	76.6	58.0	59.5	53.1	N
26/08/2016 06:30	65.9	58.0	60.1	54.3	N
26/08/2016 06:45	66.3	58.0	60.0	54.8	N
26/08/2016 07:00	80.7	58.9	60.4	55.7	N
26/08/2016 08:00	71.3	58.4	60.1	55.3	N
26/08/2016 09:00	76.8	58.3	60.0	55.5	N
26/08/2016 10:00	73.9	58.5	60.2	55.5	N
26/08/2016 11:00	74.7	58.5	60.2	55.6	N
26/08/2016 12:00	69.6	58.4	60.1	55.6	N
26/08/2016 13:00	69.7	58.1	59.9	55.4	N
26/08/2016 14:00	74.2	58.5	60.1	55.6	N
26/08/2016 15:00	75.5	58.8	60.3	55.9	N
26/08/2016 16:00	73.8	58.7	60.0	56.1	N
26/08/2016 17:00	71.2	58.4	60.0	55.6	N
26/08/2016 18:00	73.7	58.4	60.0	55.6	N
26/08/2016 19:00	72.1	58.1	60.0	54.6	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
26/08/2016 20:00	75.7	57.1	58.8	53.1	N
26/08/2016 21:00	69.6	56.2	58.6	52.0	N
26/08/2016 22:00	68.1	54.6	57.2	48.9	N
26/08/2016 23:00	65.5	53.5	56.4	47.1	N
26/08/2016 23:15	69.5	52.6	55.5	44.2	N
26/08/2016 23:30	68.0	52.0	55.0	43.2	N
26/08/2016 23:45	68.6	52.0	54.7	44.1	N
27/08/2016 00:00	60.9	49.5	53.4	38.7	N
27/08/2016 00:15	64.1	51.2	54.5	42.1	N
27/08/2016 00:30	64.3	49.8	53.5	40.1	N
27/08/2016 00:45	71.9	50.5	53.1	40.7	N
27/08/2016 01:00	67.1	48.0	51.8	38.4	N
27/08/2016 01:15	60.1	48.4	52.3	37.5	N
27/08/2016 01:30	57.9	47.6	51.9	38.7	N
27/08/2016 01:45	65.4	49.8	53.5	40.2	N
27/08/2016 02:00	62.2	47.6	51.3	37.8	N
27/08/2016 02:15	68.3	47.5	51.3	36.0	N
27/08/2016 02:30	60.4	45.9	50.0	34.8	N
27/08/2016 02:45	65.9	48.5	52.0	36.7	N
27/08/2016 03:00	61.1	46.1	50.6	35.3	N
27/08/2016 03:15	59.8	48.0	52.7	36.7	N
27/08/2016 03:30	60.1	46.8	51.5	34.7	N
27/08/2016 03:45	59.8	46.7	51.4	34.2	N
27/08/2016 04:00	61.8	47.4	51.7	35.2	N
27/08/2016 04:15	60.5	48.1	52.7	36.4	N
27/08/2016 04:30	59.4	47.2	51.4	35.3	N
27/08/2016 04:45	62.0	49.6	53.4	40.2	N
27/08/2016 05:00	58.9	49.1	53.3	39.3	N
27/08/2016 05:15	61.9	49.9	53.9	38.1	N
27/08/2016 05:30	59.5	50.5	54.4	41.4	N
27/08/2016 05:45	61.6	51.6	55.0	44.2	N
27/08/2016 06:00	70.4	53.5	56.2	44.6	N
27/08/2016 06:15	61.9	53.9	57.0	47.2	N
27/08/2016 06:30	65.0	54.3	57.0	49.0	N
27/08/2016 06:45	67.8	54.8	57.6	49.1	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
27/08/2016 07:00	76.5	56.3	58.4	51.4	N
27/08/2016 08:00	74.0	57.3	59.4	53.7	N
27/08/2016 09:00	78.3	58.3	59.9	54.9	N
27/08/2016 10:00	77.9	58.3	60.0	55.4	N
27/08/2016 11:00	71.7	58.3	59.9	55.5	N
27/08/2016 12:00	72.8	58.0	59.7	55.0	N
27/08/2016 13:00	74.0	58.0	59.5	54.8	N
27/08/2016 14:00	74.5	59.2	60.7	56.7	N
27/08/2016 15:00	74.4	59.0	60.6	56.3	N
27/08/2016 16:00	76.4	58.7	60.1	55.5	N
27/08/2016 17:00	82.7	58.7	60.2	55.8	N
27/08/2016 18:00	82.5	58.3	59.8	54.8	N
27/08/2016 19:00	71.9	57.3	59.3	53.4	N
27/08/2016 20:00	73.9	55.5	57.7	50.2	N
27/08/2016 21:00	68.5	54.2	56.7	48.4	N
27/08/2016 22:00	74.1	54.0	56.6	47.6	N
27/08/2016 23:00	69.8	54.2	56.6	48.3	N
27/08/2016 23:15	69.4	53.0	55.9	46.8	N
27/08/2016 23:30	59.9	53.7	56.6	47.9	N
27/08/2016 23:45	60.7	53.6	56.3	48.1	N
28/08/2016 00:00	68.5	53.1	55.9	45.1	N
28/08/2016 00:15	63.1	51.4	54.9	40.3	N
28/08/2016 00:30	59.5	50.3	54.3	40.2	N
28/08/2016 00:45	75.0	51.8	54.4	41.6	N
28/08/2016 01:00	61.1	49.7	53.2	42.4	N
28/08/2016 01:15	65.5	54.1	58.1	41.4	N
28/08/2016 01:30	64.5	53.1	57.5	39.9	N
28/08/2016 01:45	70.7	52.4	56.6	37.7	N
28/08/2016 02:00	82.7	56.6	58.7	40.1	N
28/08/2016 02:15	64.3	52.4	56.8	36.8	N
28/08/2016 02:30	62.0	51.1	55.7	36.1	N
28/08/2016 02:45	63.7	52.9	57.2	37.0	N
28/08/2016 03:00	64.5	51.1	55.8	35.7	N
28/08/2016 03:15	67.1	51.9	56.6	37.2	N
28/08/2016 03:30	62.9	50.5	55.0	34.6	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
28/08/2016 03:45	65.6	51.3	56.0	34.6	N
28/08/2016 04:00	63.1	50.0	55.0	32.2	N
28/08/2016 04:15	64.4	52.4	57.1	36.6	N
28/08/2016 04:30	63.0	50.8	55.9	32.1	N
28/08/2016 04:45	63.8	52.1	56.6	36.5	N
28/08/2016 05:00	64.7	51.9	56.5	36.7	N
28/08/2016 05:15	64.3	54.1	58.6	38.8	N
28/08/2016 05:30	61.0	50.6	54.1	40.5	N
28/08/2016 05:45	59.6	49.9	53.6	37.4	N
28/08/2016 06:00	68.9	52.5	55.5	42.6	N
28/08/2016 06:15	70.2	52.7	55.5	42.1	N
28/08/2016 06:30	63.9	52.8	56.1	45.8	N
28/08/2016 06:45	61.4	53.2	56.3	47.0	N
28/08/2016 07:00	66.2	55.1	57.7	49.8	N
28/08/2016 08:00	75.6	57.0	59.0	52.6	N
28/08/2016 09:00	72.1	60.1	61.9	57.4	N
28/08/2016 10:00	71.9	60.6	62.1	58.4	N
28/08/2016 11:00	75.1	60.9	62.3	58.8	N
28/08/2016 12:00	76.1	60.8	62.1	58.7	N
28/08/2016 13:00	72.1	60.8	62.3	58.4	N
28/08/2016 14:00	82.8	60.7	62.2	58.0	N
28/08/2016 15:00	77.7	60.5	61.9	57.9	N
28/08/2016 16:00	76.1	59.9	61.6	57.2	N
28/08/2016 17:00	90.3	61.2	62.0	56.9	N
28/08/2016 18:00	87.9	59.2	60.7	56.2	N
28/08/2016 19:00	75.2	58.5	60.3	54.9	N
28/08/2016 20:00	69.4	56.8	59.1	52.5	N
28/08/2016 21:00	68.7	54.9	57.7	49.5	N
28/08/2016 22:00	71.2	54.2	57.0	48.1	N
28/08/2016 23:00	62.0	54.2	57.2	48.1	N
28/08/2016 23:15	64.2	53.6	56.6	46.6	N
28/08/2016 23:30	70.4	53.9	56.8	45.3	N
28/08/2016 23:45	63.3	53.2	56.3	45.5	N
29/08/2016 00:00	63.3	53.1	56.4	44.4	N
29/08/2016 00:15	60.4	51.8	55.4	42.2	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
29/08/2016 00:30	60.8	50.6	54.3	38.9	N
29/08/2016 00:45	63.6	55.1	59.0	42.5	N
29/08/2016 01:00	66.9	54.3	58.3	39.0	N
29/08/2016 01:15	67.9	54.6	58.5	40.4	N
29/08/2016 01:30	64.5	52.6	56.9	36.3	N
29/08/2016 01:45	70.0	52.8	57.1	35.2	N
29/08/2016 02:00	64.5	53.8	58.0	39.4	N
29/08/2016 02:15	76.2	55.3	57.5	35.2	N
29/08/2016 02:30	62.1	51.5	56.5	35.3	N
29/08/2016 02:45	64.0	51.1	55.8	35.1	N
29/08/2016 03:00	77.8	52.1	56.2	34.6	N
29/08/2016 03:15	63.9	51.9	57.0	34.0	N
29/08/2016 03:30	63.3	51.5	56.6	34.6	N
29/08/2016 03:45	64.5	51.7	56.8	35.0	N
29/08/2016 04:00	65.0	51.5	56.6	34.9	N
29/08/2016 04:15	73.0	52.9	56.9	35.5	N
29/08/2016 04:30	63.3	51.7	56.8	33.7	N
29/08/2016 04:45	64.1	53.1	57.9	35.7	N
29/08/2016 05:00	67.4	54.4	58.6	40.9	N
29/08/2016 05:15	63.7	52.6	57.2	35.1	N
29/08/2016 05:30	61.8	50.1	54.5	37.1	N
29/08/2016 05:45	60.6	50.6	54.4	38.7	N
29/08/2016 06:00	59.4	51.0	54.9	39.3	N
29/08/2016 06:15	63.7	52.0	55.3	41.7	N
29/08/2016 06:30	59.9	52.6	56.3	42.5	N
29/08/2016 06:45	63.5	53.0	56.1	43.6	N
29/08/2016 07:00	67.5	54.3	57.4	46.9	N
29/08/2016 08:00	68.0	55.7	58.4	50.3	N
29/08/2016 09:00	73.2	57.7	59.7	53.7	N
29/08/2016 10:00	73.7	58.7	60.3	55.7	N
29/08/2016 11:00	68.2	58.8	60.3	56.3	N
29/08/2016 12:00	74.8	59.0	60.4	56.3	N
29/08/2016 13:00	70.9	58.7	60.2	56.0	N

TABLE 14: LT2 TABULATED MEASUREMENT RESULTS

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
24/08/2016 14:00	74.0	53.3	56.2	36.3	N
24/08/2016 15:00	74.1	51.1	54.8	36.2	N
24/08/2016 16:00	79.0	52.5	55.1	40.7	N
24/08/2016 17:00	70.7	52.0	54.8	45.9	N
24/08/2016 18:00	84.0	54.1	55.7	41.0	N
24/08/2016 19:00	74.5	50.4	53.6	42.7	N
24/08/2016 20:00	69.6	48.8	51.5	40.1	N
24/08/2016 21:00	72.2	46.5	48.3	37.7	N
24/08/2016 22:00	75.3	46.5	44.5	34.9	N
24/08/2016 23:00	63.9	39.4	35.2	30.9	N
24/08/2016 23:15	59.9	40.7	39.4	30.9	N
24/08/2016 23:30	61.0	38.6	35.1	29.8	N
24/08/2016 23:45	60.1	39.5	36.9	32.0	N
25/08/2016 00:00	59.9	39.2	35.8	28.5	N
25/08/2016 00:15	35.5	27.9	30.1	25.0	N
25/08/2016 00:30	34.2	27.3	28.7	25.4	N
25/08/2016 00:45	42.0	28.3	30.8	24.9	N
25/08/2016 01:00	65.0	39.5	36.2	27.1	N
25/08/2016 01:15	60.3	38.5	38.3	30.3	N
25/08/2016 01:30	51.7	40.0	43.2	34.5	N
25/08/2016 01:45	47.3	34.6	37.3	30.2	N
25/08/2016 02:00	42.7	33.9	36.6	29.3	N
25/08/2016 02:15	58.4	36.0	35.9	28.5	N
25/08/2016 02:30	46.5	34.6	37.5	27.5	N
25/08/2016 02:45	45.4	35.6	38.2	30.8	N
25/08/2016 03:00	57.1	36.9	37.2	29.2	N
25/08/2016 03:15	44.9	32.6	35.1	28.2	N
25/08/2016 03:30	42.5	30.6	32.7	27.0	N
25/08/2016 03:45	39.1	30.0	32.7	26.2	N
25/08/2016 04:00	41.3	31.4	34.5	26.2	N
25/08/2016 04:15	43.0	32.8	35.5	27.8	N
25/08/2016 04:30	60.4	36.5	35.8	29.7	N
25/08/2016 04:45	65.8	39.9	37.5	31.1	N
25/08/2016 05:00	73.0	47.6	40.8	32.6	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
25/08/2016 05:15	68.5	45.8	42.7	34.7	N
25/08/2016 05:30	65.1	43.6	42.7	36.2	N
25/08/2016 05:45	69.7	48.6	47.8	39.5	N
25/08/2016 06:00	67.9	48.8	47.8	40.0	N
25/08/2016 06:15	69.8	51.0	51.2	40.1	N
25/08/2016 06:30	68.5	50.7	53.3	41.7	N
25/08/2016 06:45	69.9	50.4	51.9	41.0	N
25/08/2016 07:00	76.0	51.2	51.6	39.0	N
25/08/2016 08:00	78.8	52.1	52.8	34.7	N
25/08/2016 09:00	73.6	50.3	53.4	37.7	N
25/08/2016 10:00	74.9	52.4	55.4	37.1	N
25/08/2016 11:00	75.8	50.6	53.1	32.7	N
25/08/2016 12:00	91.9	58.8	52.2	36.2	N
25/08/2016 13:00	77.9	51.7	52.8	36.2	N
25/08/2016 14:00	89.7	55.2	55.2	37.2	N
25/08/2016 15:00	68.5	49.1	52.3	37.0	N
25/08/2016 16:00	71.0	50.3	53.8	35.1	N
25/08/2016 17:00	67.4	50.2	54.4	38.8	N
25/08/2016 18:00	68.9	49.9	53.5	38.9	N
25/08/2016 19:00	77.7	51.7	54.2	40.8	N
25/08/2016 20:00	83.8	52.3	50.5	37.8	N
25/08/2016 21:00	68.7	47.7	49.2	38.9	N
25/08/2016 22:00	73.1	47.1	47.3	38.8	N
25/08/2016 23:00	67.2	46.9	49.5	38.6	N
25/08/2016 23:15	63.1	45.4	45.7	38.9	N
25/08/2016 23:30	55.0	40.2	40.7	35.6	N
25/08/2016 23:45	60.1	41.1	41.7	35.3	N
26/08/2016 00:00	68.2	46.1	42.0	34.8	N
26/08/2016 00:15	45.6	36.4	38.4	32.8	N
26/08/2016 00:30	58.8	37.7	38.5	31.9	N
26/08/2016 00:45	44.5	33.2	35.5	28.9	N
26/08/2016 01:00	57.3	35.9	36.0	29.6	N
26/08/2016 01:15	44.1	33.7	35.9	30.2	N
26/08/2016 01:30	60.2	35.4	36.8	29.2	N
26/08/2016 01:45	46.9	33.5	36.0	29.6	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
26/08/2016 02:00	53.1	31.4	33.4	27.5	N
26/08/2016 02:15	58.6	35.6	34.6	25.9	N
26/08/2016 02:30	42.3	31.3	33.6	27.3	N
26/08/2016 02:45	43.2	29.0	31.3	25.5	N
26/08/2016 03:00	51.6	31.8	31.2	25.7	N
26/08/2016 03:15	36.7	28.9	30.9	26.1	N
26/08/2016 03:30	43.9	31.4	33.9	27.5	N
26/08/2016 03:45	45.8	34.7	37.4	30.1	N
26/08/2016 04:00	60.7	38.0	38.5	31.7	N
26/08/2016 04:15	59.7	37.1	37.4	31.3	N
26/08/2016 04:30	46.2	36.6	39.0	33.4	N
26/08/2016 04:45	63.7	42.3	48.8	33.0	N
26/08/2016 05:00	66.7	44.0	41.2	36.4	N
26/08/2016 05:15	69.0	46.7	44.5	38.2	N
26/08/2016 05:30	65.8	47.1	47.5	40.3	N
26/08/2016 05:45	65.2	47.1	47.2	41.8	N
26/08/2016 06:00	74.6	50.4	49.3	42.6	N
26/08/2016 06:15	68.3	51.6	54.9	42.2	N
26/08/2016 06:30	70.0	51.5	52.1	43.1	N
26/08/2016 06:45	70.7	50.8	50.9	43.8	N
26/08/2016 07:00	76.6	51.8	52.5	43.4	N
26/08/2016 08:00	81.6	52.3	52.9	41.4	N
26/08/2016 09:00	69.8	50.4	53.8	40.8	N
26/08/2016 10:00	74.5	51.1	53.5	40.1	N
26/08/2016 11:00	78.5	52.8	54.1	40.3	N
26/08/2016 12:00	72.9	51.5	54.0	38.8	N
26/08/2016 13:00	87.2	60.7	58.5	39.0	N
26/08/2016 14:00	79.9	60.8	59.0	37.6	N
26/08/2016 15:00	90.4	56.3	54.5	38.1	N
26/08/2016 16:00	80.6	54.2	57.0	39.6	N
26/08/2016 17:00	80.4	53.2	56.3	40.4	N
26/08/2016 18:00	86.3	56.5	55.6	40.7	N
26/08/2016 19:00	76.4	51.5	54.2	40.8	N
26/08/2016 20:00	78.6	50.5	51.4	41.4	N
26/08/2016 21:00	71.6	47.8	47.9	40.1	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
26/08/2016 22:00	76.2	48.0	48.4	38.3	N
26/08/2016 23:00	71.7	47.9	45.8	37.6	N
26/08/2016 23:15	65.3	44.9	45.5	35.1	N
26/08/2016 23:30	64.5	44.1	44.6	35.2	N
26/08/2016 23:45	68.5	44.5	43.4	34.7	N
27/08/2016 00:00	57.8	39.1	38.6	32.9	N
27/08/2016 00:15	62.3	40.7	40.1	34.5	N
27/08/2016 00:30	64.9	39.9	39.4	33.4	N
27/08/2016 00:45	61.8	40.9	40.2	33.6	N
27/08/2016 01:00	54.5	38.9	41.1	35.5	N
27/08/2016 01:15	59.8	41.7	42.4	38.0	N
27/08/2016 01:30	46.0	40.5	42.3	38.0	N
27/08/2016 01:45	59.5	40.2	41.5	36.5	N
27/08/2016 02:00	50.9	38.0	39.8	35.5	N
27/08/2016 02:15	63.3	42.4	41.6	34.4	N
27/08/2016 02:30	44.2	36.9	39.4	33.7	N
27/08/2016 02:45	54.4	38.1	39.2	34.6	N
27/08/2016 03:00	57.1	38.0	38.6	33.4	N
27/08/2016 03:15	63.8	40.5	37.5	31.2	N
27/08/2016 03:30	61.0	38.0	36.9	29.3	N
27/08/2016 03:45	58.2	38.9	37.6	28.7	N
27/08/2016 04:00	59.2	35.6	35.6	28.7	N
27/08/2016 04:15	44.8	33.5	35.8	29.9	N
27/08/2016 04:30	43.0	33.2	35.7	29.9	N
27/08/2016 04:45	45.1	34.5	36.5	31.6	N
27/08/2016 05:00	60.1	36.7	35.7	31.4	N
27/08/2016 05:15	60.4	37.2	35.9	31.6	N
27/08/2016 05:30	61.2	39.1	40.1	31.8	N
27/08/2016 05:45	64.8	42.1	43.9	33.4	N
27/08/2016 06:00	63.4	44.3	46.3	34.3	N
27/08/2016 06:15	63.1	45.7	48.0	35.8	N
27/08/2016 06:30	67.4	45.9	45.0	36.2	N
27/08/2016 06:45	70.4	47.1	47.1	37.4	N
27/08/2016 07:00	72.7	48.8	47.9	37.1	N
27/08/2016 08:00	71.5	49.5	49.3	38.2	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
27/08/2016 09:00	73.4	50.5	52.9	38.6	N
27/08/2016 10:00	71.8	51.0	54.1	36.5	N
27/08/2016 11:00	75.9	51.5	54.0	35.9	N
27/08/2016 12:00	76.8	51.6	53.4	36.1	N
27/08/2016 13:00	82.9	52.1	52.8	36.8	N
27/08/2016 14:00	76.3	51.4	53.0	39.2	N
27/08/2016 15:00	84.8	54.7	52.2	37.3	N
27/08/2016 16:00	75.2	51.5	54.1	36.6	N
27/08/2016 17:00	90.8	58.3	54.3	37.4	N
27/08/2016 18:00	71.5	51.7	55.4	35.2	N
27/08/2016 19:00	75.0	50.5	53.0	35.8	N
27/08/2016 20:00	79.0	50.2	52.1	34.2	N
27/08/2016 21:00	69.9	46.4	48.0	33.6	N
27/08/2016 22:00	72.0	46.2	48.5	34.8	N
27/08/2016 23:00	66.1	45.7	47.2	36.4	N
27/08/2016 23:15	63.9	44.3	45.8	34.9	N
27/08/2016 23:30	72.0	45.5	45.9	34.2	N
27/08/2016 23:45	63.0	42.9	44.0	33.1	N
28/08/2016 00:00	70.7	45.3	42.4	33.4	N
28/08/2016 00:15	59.4	39.9	40.1	34.0	N
28/08/2016 00:30	61.5	41.2	41.6	33.8	N
28/08/2016 00:45	54.5	37.7	39.9	31.9	N
28/08/2016 01:00	64.0	39.5	38.3	31.8	N
28/08/2016 01:15	64.9	43.2	42.5	31.7	N
28/08/2016 01:30	64.3	40.7	40.2	31.9	N
28/08/2016 01:45	77.5	43.7	40.1	31.6	N
28/08/2016 02:00	57.0	38.1	40.1	31.9	N
28/08/2016 02:15	60.5	37.6	39.0	29.6	N
28/08/2016 02:30	52.8	34.0	35.7	28.8	N
28/08/2016 02:45	58.8	36.2	36.5	28.7	N
28/08/2016 03:00	60.8	40.7	41.6	28.8	N
28/08/2016 03:15	63.0	39.5	39.9	30.2	N
28/08/2016 03:30	61.9	40.5	41.4	26.0	N
28/08/2016 03:45	40.9	30.5	33.2	26.2	N
28/08/2016 04:00	62.7	37.4	33.0	25.1	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
28/08/2016 04:15	64.1	40.3	36.2	26.0	N
28/08/2016 04:30	58.0	34.2	32.4	24.4	N
28/08/2016 04:45	42.9	30.9	33.3	26.7	N
28/08/2016 05:00	43.7	33.3	35.8	29.0	N
28/08/2016 05:15	45.7	34.6	37.4	30.3	N
28/08/2016 05:30	56.3	38.2	40.2	31.9	N
28/08/2016 05:45	62.8	40.6	40.7	32.5	N
28/08/2016 06:00	55.8	39.2	41.8	34.4	N
28/08/2016 06:15	69.1	45.2	44.2	35.6	N
28/08/2016 06:30	62.8	43.3	45.1	35.9	N
28/08/2016 06:45	71.7	44.8	46.0	37.0	N
28/08/2016 07:00	72.3	46.0	46.1	38.0	N
28/08/2016 08:00	68.4	47.0	47.8	40.2	N
28/08/2016 09:00	71.2	50.3	51.0	42.7	N
28/08/2016 10:00	81.2	52.8	54.4	44.0	N
28/08/2016 11:00	71.7	52.0	54.8	45.3	N
28/08/2016 12:00	87.6	55.8	55.3	45.4	N
28/08/2016 13:00	89.8	58.7	55.9	45.9	N
28/08/2016 14:00	76.3	52.7	55.2	45.1	N
28/08/2016 15:00	72.4	52.0	54.3	44.0	N
28/08/2016 16:00	80.9	53.4	54.6	43.4	N
28/08/2016 17:00	74.6	51.1	53.8	42.5	N
28/08/2016 18:00	73.0	50.8	53.4	42.0	N
28/08/2016 19:00	98.9	64.8	51.0	40.0	N
28/08/2016 20:00	69.5	49.0	49.2	39.6	N
28/08/2016 21:00	69.3	47.1	44.8	36.9	N
28/08/2016 22:00	68.0	45.9	45.7	38.2	N
28/08/2016 23:00	64.6	44.9	44.4	39.8	N
28/08/2016 23:15	70.3	42.9	42.3	38.9	N
28/08/2016 23:30	63.2	43.9	44.0	39.3	N
28/08/2016 23:45	63.3	44.4	43.2	38.5	N
29/08/2016 00:00	63.8	42.7	42.8	38.9	N
29/08/2016 00:15	63.0	43.3	42.4	37.6	N
29/08/2016 00:30	49.8	37.6	39.3	34.7	N
29/08/2016 00:45	62.5	40.1	39.5	33.8	N

Time & Date	L _{AFmax} (dB)	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	Rain
29/08/2016 01:00	41.5	34.9	37.0	31.8	N
29/08/2016 01:15	65.1	42.6	39.6	33.1	N
29/08/2016 01:30	60.3	38.3	38.1	30.7	N
29/08/2016 01:45	59.4	36.7	35.3	29.2	N
29/08/2016 02:00	65.7	41.6	38.3	31.5	N
29/08/2016 02:15	57.1	37.1	38.7	29.1	N
29/08/2016 02:30	62.9	40.1	37.7	28.2	N
29/08/2016 02:45	55.6	35.1	36.3	28.6	N
29/08/2016 03:00	61.5	37.2	36.5	29.1	N
29/08/2016 03:15	56.8	35.3	37.5	29.7	N
29/08/2016 03:30	61.1	34.9	36.9	29.2	N
29/08/2016 03:45	64.2	39.1	37.5	28.2	N
29/08/2016 04:00	62.5	40.9	38.7	29.3	N
29/08/2016 04:15	65.5	38.4	35.9	29.6	N
29/08/2016 04:30	50.4	34.3	36.9	27.9	N
29/08/2016 04:45	59.9	38.0	38.7	30.6	N
29/08/2016 05:00	62.5	39.8	39.4	33.5	N
29/08/2016 05:15	56.8	36.9	37.9	30.1	N
29/08/2016 05:30	56.5	38.9	41.8	33.4	N
29/08/2016 05:45	67.4	44.3	42.8	33.7	N
29/08/2016 06:00	63.6	41.9	42.5	36.3	N
29/08/2016 06:15	60.8	41.3	42.6	35.7	N
29/08/2016 06:30	59.8	40.6	41.8	36.2	N
29/08/2016 06:45	63.9	43.8	43.8	37.5	N
29/08/2016 07:00	69.6	46.4	46.2	38.5	N
29/08/2016 08:00	70.3	48.1	48.9	38.0	N
29/08/2016 09:00	74.0	50.9	51.5	38.9	N
29/08/2016 10:00	88.6	53.7	51.1	38.8	N
29/08/2016 11:00	70.6	49.3	52.3	38.9	N
29/08/2016 12:00	68.6	49.4	52.3	38.5	N
29/08/2016 13:00	88.5	55.6	53.6	39.2	N

8.5. Appendix E – Measurement Position Photographs

FIGURE 5: LT1 PHOTOGRAPH



FIGURE 6: LT2 PHOTOGRAPH



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Exeter
Plymouth
Truro

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01872 672400

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